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ABSTRACT

This paper addresses the characteristics and applications of artificial intelligence (AI) as a subsection of computer science, and briefly describes the most common types of AI programs: expert systems, natural language, and neural networks. Following a brief presentation of the historical background, the discussion turns to an explanation of how expert systems function; developers' as opposed to users' goals for expert systems; internal as opposed to external applications/utilization of AI; funding; and the market place for expert systems, including medicine, banking, planning assistance for professionals, and education. (3 references) (CGD)

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ARTIFICIAL INTELLIGENCE IN BUSINESS: TECHNOCRAT JARGON OR QUANTUM LEAP?

prepared jointly for AVA Convention Information Exchange Session
St. Louis, Missouri, December 3, 1988
by
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For a number of years we have been reading about the "smart" machines and artificial intelligence, but many of us have pondered whether these terms were "science, fiction, or reality." My purpose today, with the assistance of Dr. Wilson's input, is to report to you some state-of-the-art information about AI.

Artificial Intelligence

AI, a subsection of computer science, uses simulation of human learning to suggest relevant questions and relevant cases bearing on some decision faced by humans. The term means different things to different people. Academics take a narrow view that AI seeks to develop computer models of human intelligence; whereas developers of business software are less dogmatic and may put the AI label on any product that may be considered "smart," or the ones that possess an advanced level of "IF, THEN" statements. AI products generally fall into one of three categories: Expert systems, natural language systems, and neural networks.

Expert systems. ES are the most common type of commercial AI programs. These are problem-solving computer programs that are based on experts' expertise and heuristics to solve problems. ES can be built to solve problems in the areas of prediction, diagnosis, interpretation, design, planning, monitoring, debugging, instruction, or control. To build an ES, the builder has to work with the expert to extract the expert's knowledge and encode a knowledge base into a computer program. The steps involve identifying the problem, scope, objectives, available resources; and then conceptualizing major elements, relationships, and information characteristics. THE IDEA IS TO MAKE THE EXPERT'S KNOWLEDGE AVAILABLE TO THE NOVICE VIA A COMPUTER MODEL.

Natural-Language. These programs come closer to representing human cognition than any others discussed in the literature.

Neural Networks. This is the most ambitious form of artificial intelligence and is still in the laboratory.

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Historical Background

The first published AI papers appeared about thirty years ago. Interest has waxed and waned since that time. During the first stages from 1955 to 1969, progress was slow because of limitations on computer resources--core memory was not more than a few thousand words in those days.

Much of the technical base for today's "stage three" was laid down during the 1970s. Today's AI has produced vehicles for representing complex, nonnumeric knowledge. One of the ways in which AI systems differ from conventional computing is that they usually deal with "knowledge," in addition to data and information. Researchers have become aware of the common elements underlying the particular cases. As they do, they begin to build up a body of concepts. This in-depth knowledge of general problems and what to do about them has become a basic element of the analysis and design aspects of "knowledge engineering." (Reitman, 1983)

Understanding Expert Systems

Most expert systems developed to date are designed to function in an advisory manner, because simulating exactly how humans think and store information is extremely difficult. A problem: We humans do not really know our decision rules. Many human decisions are based on intuition. The computer models are not able to exhibit intuition, but ES models are utilizing "inferences engines" to simulate thought patterns--how to get from data to conclusions.

Expert systems make recommendations, and a human expert reviews the recommendations and the logic before the decision is implemented. In this way ES function as a Decision Support System (DDS). The advantages of the computer are speed, accuracy in calculations, consistency of repeated actions; absence of emotional biases, value-judgment inhibitors, and/or fear of being wrong or unable to continue on a project. AI cannot be diverted by humor or tragedy!

> Expert systems are designed to use an expert's knowledge and an expert's way of thinking to achieve the kind of results that an expert would get if he considered the same problem. But it has the potential of using the knowledge and processes of several experts and eventually becoming "smarter" than any one person. (Long, 1985)

(Humans may be reluctant to accept the advice of expert systems; we want to feel that we are smarter than a machine. ES models may be slower to "learn" than human intelligence, but have more data on a specialized topic and can process the data extremely fast.)

Developers/Users of Expert Systems

Developers' goals may differ from users' goals for expert systems. Users are concerned about the following features:

Fast execution of complex analytic models
Availability of a decision logic audit trail
Provisions for the user to change the decision logic
Ease of data collection
Flexibility of data entry for reports
Cost-effective software

An example of how objectives may differ for the user and developer: The user may wish to have the flexibility to change some of the decision logic; whereas, developers are concerned about means to prevent direct user access to decision logic; thereby protecting the integrity of the system. These types of problems are being addressed, and in some cases resolved.

Funding

Growth is expected to be rapid because of trends in funding: Large corporations, more software houses backed by venture capital from a number of sources, and funding from the government. The U.S. Government is now funding the development of an expert system for the Internal Revenue Service.

AI Utilization

When considering AI untilization, we ask questions like:

1. How rare are solutions to the problem?
2. How decomposable is the problem?
3. How formal(izable) is the knowledge?
4. How difficult is it to elicit the knowledge?
5. How much error is there in the knowledge base?

Expert sytems are extremely popular, but the trend has been toward internal applications. Many ES do not lend themselves to sale as external products.

The Market Place

Expert Systems for Medicine:

Some current systems are designed to provide advice regarding diagnosis and therapy for infectious diseases. Medical knowledge is encoded in a set of rules. Each rule is intended to represent

a single, independent "chunk" of domain-specific knowledge that indicates a possible conclusion. Via goals and subgoals, the system builds a history tree. Whenever the system asks a question, the user may examine the current reasoning chain by a query as to why the system is asking the question. To respond, the system searches the history tree seeking a higher-level goal which it is attempting to satisfy. Some limitations have been (1) lack of knowledge needed to support explanation, and (2) the lack of a general model of explanation. These limitations are being corrected by some recent updating--instead of identifying a needed drug, the newer systems also prescribe the proper dosage.

Additional applications for medicine are:
Identification of contential heart disease
Diagnosis of lung disease
Advice in diagnosis of neurological disorders.

Expert systems in Banking:

Applications are being made in credit risk analysis, portfolio management and analysis, credit approval, loan application processing, money transfer processing, loan monitoring, teller training, financial planning services, and intelligent message understanding.

Planning Assistance:

Some programs were developed as early as 1982-83. These planning programs provide support tools for professionals in several different areas. Personal data, both quantitative and qualitative (qualitative: debts, attitudes about risk, etc.) are collected from client. When fed into the computer, the system performs a comprehensive analysis, makes diagnostic conclusion, and generates recommended actions.

Education:

Great promises exist that ES will lead students though sequencing that will aid and speed up the learning process.

Example of updates:

VP-Expert--(Updated from 1.2 version to 2.0)
An ES shell can be used by experts without a computer background. Example: Tax planning--provides the planner with probabilitities of acceptable results.

Concluding Thoughts

As educators we have a natural tendency to consider some changes as "old wine in new bottles,"--not true with AI. Most of us will not be involved in building an expert system, but we will be involved in making wise software investments. Unfortunately, Some teachers continue to be much more concerned

about computer hardware. Manufacturers have, for the most part, conceded that there are no stars in crowns for guaranteeing a market though incompatiability and exclusivity; therefore, we have entered the era of compatibility in hardware. It's time to change gears!

Never before have disciplines needed to share more of their expertise. We need to respect and learn from each other for the benefit of the students and not only for the benefit of our "turf." Could we become a little more proactive to change instead of reactive?

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